

What is claimed is

- 1 1. A method for manufacturing ohmic contact to a semiconductor  
2 including the steps of: forming a plurality of metals on a semiconductor  
3 material; heat-treating the plurality of metals in an oxidizing  
4 environment so that at least one of the plurality of metals is oxidized  
5 to form a p-type semiconductor oxide.  
6
- 1 2. A manufacturing method as claimed in claim 1 wherein the  
2 semiconductor material is p-type  $\text{Al}_x\text{Ga}_y\text{In}_z\text{N}$ , and  $0 < x, y, z < 1$ , and  $x + y + z$   
3 = 1.  
4
- 1 3. A manufacturing method as claimed in claim 1 wherein the plurality  
2 of metals includes at least a transition metal which can transform into  
3 a p-type semiconductor oxide.  
4
- 1 4. A manufacturing method as claimed in claim 1 wherein the plurality  
2 of metals includes at least a noble metal which is one of Au, Pt, Rh,  
3 Ru, and Ir.  
4
- 1 5. A manufacturing method as claimed in claim 1 wherein the film formed  
2 on the semiconductor material can be an alloy of transition metal and  
3 noble metal.  
4

1 6. A manufacturing method as claimed in claim 2 wherein the  
2 semiconductor material is p-type GaN.

1 7. A manufacturing method as claimed in claim 3 wherein the transition  
2 metal is one of Ni, Mn, Fe, Co, Cr, Cu and Pd.

1 8. An ohmic contact to a semiconductor which is formed on a  
2 semiconductor material, including a mixture of p-type semiconductor  
3 oxide and metal.

1 9. An ohmic contact as claimed in claim 8 wherein the p-type  
2 semiconductor oxide includes a single oxide.

1 10. An ohmic contact as claimed in claim 8 wherein the p-type  
2 semiconductor oxide includes a mixture of various oxides.

1 11. An ohmic contact as claimed in claim 8 wherein the p-type  
2 semiconductor oxide includes a solid solution of various oxides.

1 12. An ohmic contact as claimed in claim 8 wherein the semiconductor  
2 material is p-type  $\text{Al}_x\text{Ga}_y\text{In}_z\text{N}$ , and  $0 < x, y, z < 1$ , and  $x + y + z = 1$ .

1 13. An ohmic contact as claimed in claim 8 wherein the p-type  
2 semiconductor oxide is one of NiO, MnO, FeO,  $\text{Fe}_2\text{O}_3$ , CoO, CrO,  $\text{Cr}_2\text{O}_3$ ,  $\text{CrO}_2$ ,

3 CuO, Cu<sub>2</sub>O, SnO, Ag<sub>2</sub>O, CuAlO<sub>2</sub>, SrCu<sub>2</sub>O<sub>2</sub>, and PdO.

1 14. An ohmic contact as claimed in claim 8 wherein the metal is Au,  
2 Pt, Rh, Ru, or Ir.

1 15. An ohmic contact as claimed in claim 12 wherein the semiconductor  
2 material is p-type GaN.

1 16. An ohmic contact to a semiconductor, which is formed on a  
2 semiconductor material, including a layer of p-type semiconductor  
3 oxide and a conductive layer.

1 17. An ohmic contact as claimed in claim 16 wherein the semiconductor  
2 material is p-type Al<sub>x</sub>Ga<sub>y</sub>In<sub>z</sub>N, and 0 < x, y, z < 1, and x + y + z = 1.

1 18. An ohmic contact as claimed in claim 16 wherein the p-type  
2 semiconductor oxide is one of NiO, MnO, FeO, Fe<sub>2</sub>O<sub>3</sub>, CoO, CrO, Cr<sub>2</sub>O<sub>3</sub>, CrO<sub>2</sub>,  
3 CuO, Cu<sub>2</sub>O, SnO, Ag<sub>2</sub>O, CuAlO<sub>2</sub>, SrCu<sub>2</sub>O<sub>2</sub>, LaMnO<sub>3</sub>, YBa<sub>2</sub>Cu<sub>4</sub>O<sub>8</sub> and PdO.

1 19. An ohmic contact as claimed in claim 16 wherein the layer of  
2 semiconductor oxide includes a single oxide layer.

1 20. An ohmic contact as claimed in claim 16 wherein the layer of  
2 semiconductor oxide includes a plurality of layers of oxides of the

3 same conductivity type.

1 21. An ohmic contact as claimed in claim 16 wherein the layer of  
2 semiconductor oxide includes a mixture layer of various oxides.

1 22. An ohmic contact as claimed in claim 16 wherein the layer of  
2 semiconductor oxide includes a solid solution layer consisting of  
3 various oxides.

1 23. An ohmic contact as claimed in claim 16 wherein the conductive layer  
2 includes a single metal layer.

1 24. An ohmic contact as claimed in claim 16 wherein the conductive layer  
2 includes a plurality of metal layers.

1 25. An ohmic contact as claimed in claim 16 wherein the conductive layer  
2 is a transparent conductive film.

1 26. An ohmic contact as claimed in claim 17 wherein the semiconductor  
2 material is p-type GaN.

1 27. An ohmic contact as claimed in claim 25 wherein the transparent  
2 conductive film is conductive oxide, including indium-tin oxide, ZnO  
3 and ZnO doped with Ga, In, Al or Ce.